



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Yoichi Mizuno

Group Art Unit: 1714

Serial Number: 10/757,530

Examiner: Poulos Sandra K

Filed: January, 15, 2004

For: RUBBER COMPOSITION AND PNEUMATIC TIRE USING THE
SAME

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Yoichi Mizuno residing at 2-3-1301, Mukogawachou,
Namase, Nishinomiya-shi, Hyogo-ken, Japan duly deposes and says:

1. That he graduated from Department of applied chemistry, Faculty of Engineering, Nagoya Engineering University, Nagoya, Japan, in the year 1990, and he received the degree of Master of material engineering from Graduate School of Nagoya Engineering University, Nagoya, Japan in the year 1992;

2. That since 1992, he has been employed in the capacity of Sumitomo Rubber Industries, Ltd.;

3. That from 2003 he has been engaged in development for rubber compositions of tires for passage cars;

4. That he has read and is familiar with the instant application for United States Letters Patent and Office Action thereto

mailed September 29, 2005.; and

5. That he has made experiments in order to show that, blending Cobalt Stearate as a Cobalt Metallic Salt provides the sufficient stability of the unvulcanized rubber, and that blending Cobalt Naphthenate as a Cobalt Metallic Salt cannot provides the sufficient stability of the unvulcanized rubber.

Experiments

Experimental Example 1 to 4

The compounds shown in Table 1, excluding sulfur and the vulcanization accelerator, were kneaded for 5 minutes at approximately 150 °C using a Banbury mixer. Thereafter, sulfur and the vulcanization accelerator were added to the obtained rubber composition and kneading was conducted for 5 minutes at approximately 80 °C using a twin-screw open roll.

The obtained rubber composition for a strip was molded and vulcanized under conditions of 150 °C, 30 minutes and 20 kgf. Then, a truck tire of 11R22.5 was prepared.

The Heat generation, the Elastic modulus, the Elongation at break test, and the Adhesion level from the obtained new tire, and the Elastic modulus, the Elongation at break test, and the Adhesion level from the tire after running were measured in the same manner as Example 1 to 24 and Comparative Example 1 to 7 of the present specification.

Furthermore, the Change of the Mooney viscosity with passage of time is measured in the following manner.

(Change of the Mooney viscosity with Passage of Time)

The Mooney viscosity (ML_{1+4}) of the new rubber composition, the rubber composition after leaving for 10 days, and the rubber composition after leaving 20 days were measured at 130 °C according to the method for measuring the Mooney viscosity defined in JIS K 6300. Thereafter, the difference of the Mooney viscosity between the new rubber composition and the rubber composition after leaving 20 days (ΔML_{1+4}) was calculated. The stability of the unvulcanized rubber becomes advanced as ΔML_{1+4} decreases.

The results are shown in Table 1.

Table 1

	Exp. Ex. 1	Exp. Ex. 2	Exp. Ex. 3	Exp. Ex. 4
Composition (parts by weight)				
Natural Rubber	100	100	100	100
Carbon Black 1 N326	60	60	60	60
Resorcin Resin 1	1	1	1	1
Compound capable of providing a methylene group 1	1.5	1.5	1.5	1.5
Cobalt Stearate (Cobalt content 10 % by weight)	1	0.5	—	—
Cobalt Naphthenate (Cobalt content 6 % by weight)	—	—	1.67	0.83
Cobalt metal content	0.1	0.05	0.1	0.05
Antioxidant	2	2	2	2
Zinc Oxide	10	10	10	10
Sulfur	5	5	5	5
Vulcanization accelerator	0.8	0.8	0.8	0.8

Table 1-continued

	Exp. Ex. 1	Exp. Ex. 2	Exp. Ex. 3	Exp. Ex. 4
Properties when New				
Heat Generation	110	108	109	108
Elastic Modulus	110	109	112	110
Elongation at Break	97	101	96	99
Adhesion Test	5	4	5	4
Properties after Running				
Elastic Modulus	112	117	114	110
Elongation at Break	79	77	76	80
Adhesion Test	5	3	5	3
Change of the Mooney viscosity with Passage of Time				
When new	71	70	69	72
After 10 days	69	69	64	70
After 20 days	67	67	59	65
ΔML_{1+4}	4	3	10	7

Carbon black 1 N326: Diablock LH available from Mitsubishi Chemical Corporation, Iodine Absorption of 84 g/kg, DBP Oil Absorption of $74 \times 10^{-5} \text{ m}^3/\text{kg}$.

Resorcin Resin 1: sumikanol 620 available from Sumitomo Chemical CO., Ltd.

Compound capable of providing a methylene group 1: Sumikanol 507 (mixture of approximately 50 % of substance having a methylene group, silica and oil) available from Sumitomo Chemical Co., Ltd.

Cobalt Stearate: Cobalt Stearate (containing 10 % by weight of cobalt) available from Dainippon Ink and Chemicals, Incorporated.

Cobalt Naphthenate: Cobalt Naphthenate (containing 6 % by weight of

cobalt) available from Dainippon Ink and Chemicals, Incorporated.

Antioxidant: Ozonone 6C available from Seiko Chemical Co., Ltd.

Zinc Oxide: Ginrei R available from Toho Zinc Co., Ltd.

Sulfur: Sulfur available from Tsurumi Chemicals Co., Ltd.

Vulcanization accelerator: Nocceler DZ (N,N'dicyclohexyl-2-benzothiazolylsulfenamide) available from Ouchi Shinko Chemical Industrial Co., Ltd.

Results and Discussions

In Experimental Example 1 and 2, blending Cobalt Stearate as a Cobalt Metallic Salt provides the sufficient stability of the unvulcanized rubber.

At the same time, in Experimental Example 3 and 4, blending Cobalt Naphthenate as a Cobalt Metallic Salt decreases the stability of the unvulcanized rubber even if the rubber composition satisfies all other components ((A) to (D)).

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 24th day of February, 2006

by Yoichi Mizuno
Yoichi Mizuno

We, the undersigned witnesses, hereby acknowledge that Mamoru Uchida is personally known to us and did execute the foregoing Declaration in our presence on:

Date: February 24, 2006 Witness Yutaka Sakon

Date: February 24, 2006 Witness Hazuoki Morita